DP-305003

IN THE SPECIFICATION

Please amend the Summary of the Invention as follows (Page 2, line 11 – Page 4, line 7):

The disadvantages and drawbacks of the prior art are overcome by the exhaust system components and method of the present invention. In one embodiment, the exhaust system component comprises: a shell and an oxygen sensor. The shell has an outer wall and an inner wall, wherein the shell forms a bushing that defines an opening through and connects the outer wall and the inner wall. The oxygen sensor is disposed though the bushing such that a portion of the oxygen sensor extends into an interior portion of the component.

~~The exhaust system comprises a catalytic converter unit, a bushing element provided in a shell wall of the catalytic converter unit, and an oxygen sensor positioned within exhaust flow of the catalytic converter unit and extending through the bushing element and having a connector disposed in intimate contact with the bushing element. In a preferred arrangement, a bushing element is provided in a housing wall of an endcone of a catalytic convertor, and an oxygen sensor having a connector is disposed in intimate contact with said bushing element to thereby mount the sensor in the exhaust flow. By mounting the oxygen sensor through the catalytic converter endcone, the sensor no longer extends radially out from the centerline of the exhaust flow, but rather is positioned at an angle to the centerline of the exhaust component and, accordingly, facilitates packaging the system underneath a vehicle.~~

~~The disclosed exhaust system integrates an O_2 sensor into a catalytic converter unit, preferably an endcone assembly. The catalytic converter and endcone may be either internally insulated or non-internally insulated. The mat insulating material typically between the inner and outer housing layers of the converter endcone should be protected from the exhaust gases in order to maintain control of the outer skin temperature as well as prevent erosion of the insulation material sandwiched between the outer and inner cone surfaces. Therefore, it is preferred in mounting the oxygen sensor in the endcone to fabricate a bushing accomplishing a seal between the inner and outer endcones. Flats may be formed in the inner and outer endcone surfaces to facilitate good fit-up either for flow drilling or welding bushing applications.~~

~~The oxygen sensor bushing through which the sensor is mounted may be formed into the shell of the converter, preferably at the tapered endcone, by form drilling, as described in detail herein, or welded into the endcone using techniques such as arc welding, friction/inertia welding,~~

rotated drawn arc welding, flash/forge welding, metal inert gas (MIG) welding, or other such suitable welding methods.

A preferred method for connecting an oxygen sensor to an exhaust system comprises contacting the outer sheet metal wall of an exhaust system component with a blunt rotated bit; the friction between the surfaces softening the material of the wall where said rotated bit contacts the exhaust system component, allowing the bit to be pushed through the outer and then inner walls; penetrating the softened material with said rotated bit to form an extruded skirt that can be roll formed and threaded to create a bushing; and, using a connector, mounting an oxygen sensor within the bushing. In a double walled construction, such as a typical endcone arrangement, preferably, the extruded skirt material formed when penetrating the outer wall merges with the upset material formed when penetrating the inner wall, so as to result in a continuous connection between the two walls, that can be tapped to accept a threaded connector of an oxygen sensor.

Another suitable technique includes friction/inertia welding wherein a bushing (in this case tapered to contact the two layers of pre-drilled endcone wall material) is rotated at high speed and hold against the sheet metal cone material. The heat generated by the friction softens the bushing and two layers of endcone wall material, which then are pressed together creating a sealing/structural bond.

In rotated drawn arc welding, a current is passed through a bushing component and a pre-drilled wall of a converter endcone. The parts then are moved apart (drawn) until an arc has the required energy to perform the welding process. A rotating magnetic field is then used to cause the arc to move around the circumference of the bushing (heating the circular future contact area). When the bushing and endcone parts are heated sufficiently, they then are forced together to form a bond.

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Please insert the following paragraph into the Summary of the Invention, Page 4, before line 7 (i.e., before the paragraph "The above described..."):

In another embodiment, the exhaust system component comprises: an endcone, an oxygen sensor, and a gasket. The endcone has an outer wall and an inner wall. The outer wall forms a bushing that defines an opening through and connects the outer wall and the inner wall. The bushing has a flat surface on an end opposite the inner wall. The oxygen sensor is disposed though the bushing such that a portion of the oxygen sensor extends into an interior portion of the component. The gasket is disposed in intimate contact with the flat surface and the oxygen sensor.

Please amend Page 5, after line 4 and before line 5 insert the following paragraphs:

The exhaust system comprises a catalytic converter unit, a bushing element provided in a shell wall of the catalytic converter unit, and an oxygen sensor positioned within exhaust flow of the catalytic converter unit and extending through the bushing element and having a connector disposed in intimate contact with the bushing element. In a preferred arrangement, a bushing element is provided in a housing wall of an endcone of a catalytic converter, and an oxygen sensor having a connector is disposed in intimate contact with said bushing element to thereby mount the sensor in the exhaust flow. By mounting the oxygen sensor through the catalytic converter endcone, the sensor no longer extends radially out from the centerline of the exhaust flow, but rather is positioned at an angle to the centerline of the exhaust component and, accordingly, facilitates packaging the system underneath a vehicle.

The disclosed exhaust system integrates an O_2 sensor into a catalytic converter unit, preferably an endcone assembly. The catalytic converter and endcone may be either internally insulated or non-internally insulated. The mat insulating material typically between the inner and outer housing layers of the converter endcone should be protected from the exhaust gases in order to maintain control of the outer skin temperature as well as prevent erosion of the insulation material sandwiched between the outer and inner cone surfaces. Therefore, it is preferred in mounting the oxygen sensor in the endcone to fabricate a bushing accomplishing a seal between the inner and outer endcones. Flats may be formed in the inner and outer endcone surfaces to facilitate good fit-up either for flow drilling or welding bushing applications.

The oxygen sensor bushing through which the sensor is mounted may be formed into the shell of the converter, preferably at the tapered endcone, by form drilling, as described in detail herein, or welded into the endcone using techniques such as arc welding, friction/inertia welding, rotated drawn arc welding, flash/forge welding, metal inert gas (MIG) welding, or other such suitable welding methods.

A preferred method for connecting an oxygen sensor to an exhaust system comprises contacting the outer sheet metal wall of an exhaust system component with a blunt rotated bit; the friction between the surfaces softening the material of the wall where said rotated bit contacts the exhaust system component, allowing the bit to be pushed through the outer and then inner walls; penetrating the softened material with said rotated bit to form an extruded skirt that can be roll formed and threaded to create a bushing; and, using a connector, mounting an oxygen sensor within the bushing. In a double-walled construction, such as a typical endcone arrangement, preferably, the extruded skirt material formed when penetrating the outer wall merges with the upset material formed when penetrating the inner wall, so as to result in a continuous connection between the two walls, that can be tapped to accept a threaded connector of an oxygen sensor.

Another suitable technique includes friction/inertia welding wherein a bushing (in this case tapered to contact the two layers of pre-drilled endcone wall material) is rotated at high speed and held against the sheet metal cone material. The heat generated by the friction softens the bushing and two layers of endcone wall material, which then are pressed together creating a sealing/structural bond.

In rotated drawn arc welding, a current is passed through a bushing component and a pre-drilled wall of a converter endcone. The parts then are moved apart (drawn) until an arc has the required energy to perform the welding process. A rotating magnetic field is then used to cause the arc to move around the circumference of the bushing (heating the circular future contact area). When the bushing and endcone parts are heated sufficiently, they then are forced together to form a bond.

Please amend Page 6, lines 7 – 15 as follows:

The surface geometry of the collar surface, in any case, should conform to the geometry of the oxygen sensor to be mounted. If, for instance the sealing surface of the oxygen sensor is flat, the collar surface should be flat, while if the sealing surface of the oxygen sensor is beveled, the collar surface should be beveled. Otherwise, either where the geometries differ between the sensor mount and the collar surface, or where the rotated bit is not indexed down to completion such that the collar surface shapes the upset material appropriately, some additional means of sealing, such as a gasket 36, should be employed to ensure the integrity of the seal.

Please amend Page 8, lines 11 – 18 as follows:

A rotated bit was utilized to form an integral bushing on a North American trapezoid catalytic converter endcone assembly 30 (shown in Figure 8), which is illustrated as connected to the catalytic converter 38. The North American trapezoid endcone assembly 30, which consists of an outer surface material, an inner cone 40, and a mat material therebetween, was fabricated with a precut, 25 mm hole 42 located in the inner endcone 40 and through the mat material. The path of the rotated bit being cleared below, bushing formation was performed in the top side of the endcone 30 on the surface of the outer cone.